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Wavelet transforms

The project uses 1-D signals to keep things simple.

The first part is see a what a wavelet looks like. They generally have differing detail at different scales

1. Place an impulse in a vector **x**, and perform the inverse WT for different positions of the impulse to see wavelets and different scales and shifts. This will show what scale and shift of the wavelet transform corresponds to what particular location in the wavelet domain. For example, for a length 256 input, locations 129-256 correspond to the smallest scale, 65-128 to the next smallest, 33-64 to the next and so on. Verify that two adjacent impulses at the smallest scale corresponds to a wavlet shift of 2 pixels when the inverse transform is applied. Verify that at the next smallest scale the adjacent impulses correspond to a four-pixel shift. Next scale gives an 8-pixels shift and the next gives a 16-pixel shift. At every larger scale the wavelet will have more detail. Do this for four different levels. Use the wavelet 'db2' or similar and the commant four different scales and notice the increase in detail. Use the Matlab command waverec.m.

The second part is about energy compaction
2. Take the Wavelet transform of a signal. Something with a range of frequencies as in a short pulse, or pulses. Retain 25% of its largest coefficients (set the rest to 0) and reconstruct the signal. Do the same using the Fourier Transform and compute the MSE between the reconstructed signal and the original.

Repeat for the top 10% of coefficients. Generally, the WT will give a lower MSE.